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REGIONAL ENERGY ECONOMICS: THE IMPACT OF THE PRICE INCREASES OF THE 1970s

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SUMMARY

Rising energy prices have had a substantial negative impact on the national economy since the Arab oil embargo of 1973. According to the U.S. Department of Energy:

- Real gross national product was reduced by $25 billion to $55 billion annually between 1974 and 1978, up to $60 billion in 1979, and $95 billion in 1980.
- Higher energy prices added an average of 1.9 to 2.5 percentage points to the Consumer Price Index and 1.5 to 2.3 percentage points to the gross national product price deflator.
- Employment losses attributable to higher energy prices were estimated at 900,000 to 2.1 million.

Energy prices vary widely among the states. In general, three factors contribute most heavily to these price differences: distance from the source of supply (this translates into transportation costs), type of supply available (the average price of fuels varies widely), and state or local taxes or rate standards. A combination of these factors contributed to the following variations in average state energy prices by sector in 1978:

- Residential. Average state residential prices varied by 159 percent, from a high of $4,191/billion Btu in New Jersey to a low of $1,617 in Washington State.
- Commercial. Average state commercial prices varied by 117 percent, from a high of $3,688/billion Btu in Delaware to a low of $1,701 in Washington State.
- Industrial. Average state industrial prices varied by 184 percent, from highs of $3,120/billion Btu in New Hampshire and New Jersey to a low of $1,099 in Washington State.
- Transportation. Average state transportation prices varied the least--39 percent--from a high of $5,117 in Connecticut to a low of $3,677 in Louisiana.

It is difficult to predict with any certainty whether average state price variations will narrow or widen in the long term. Regional differences in the total amount households spend on energy vary substantially, however, because they are a function of both price and consumption. Weather conditions dictate to a great extent both heating and cooling requirements. In the New England Census Division, for example, the average household heating with fuel oil consumed 961 gallons, compared to 494 gallons in the East South Central Division.

The Energy Department has projected that regional differences in the total amount households spend on energy will increase over the next decade, with only a slight shift in the relative position of regions resulting from the scheduled deregulation of natural gas. Although natural gas prices will rise under deregulation, DOE assumes higher prices will result in lowered consumption, holding down the overall cost of household energy.

Increasing energy prices have had different effects on state and local economies. The overall impact was to increase the flow of money from energy-consuming to energy-producing states. In addition, recent analyses of energy and economic performance support the following conclusions:

- The impact of rising energy prices was the most severe in the Midwest, because of its greater dependence on manufacturing employment (automobiles, steel, etc.). The Northeast's economy also slowed as a result of continuing high energy prices. Producing regions within the South and West fared the best, in part because of the multiplier effects of expanded employment in energy production industries. These areas registered gains in population, employment, and per capita income.

- DOE concluded that the economic effects of higher energy prices were significant, cumulative, and long-lasting. Rising energy prices continued to affect the economy for several years after the 1973-74 increase, with price increases in 1979 and 1980 adding to the negative impact of earlier increases.

- Regional energy price differences parallel current patterns of population shifts, employment growth, and economic development from the Northeast and Midwest to the South and West. The impact is attributed to the growth rate of new firms and employment opportunities that affect location decisions of relatively young, well-educated workers.

- Energy costs excluding gasoline accounted for most of the state household energy cost differences. Variations in the average cost and quantity of fuel consumed among regions for heating/cooling requirements and appliance usage are expected to lead to increased regional differences as a result of higher energy prices.

- Transportation costs as a factor in future household energy expenditures are expected to decline with more rapid efficiency gains in automobiles. Household energy consumption will decline more slowly because of slower turnover in the housing stock. Substantial variations in the percentage of older building stock also contribute to regional cost differences.

Urban/Rural Differences

Recent studies have documented differences in urban and rural energy prices, consumption and total expenditures. Rural households consume less energy on average than urban households, but pay more for it. Higher fuel

costs in rural areas reflect the fact that rural households consume 40 percent more electricity than urban areas. Because electricity is the highest priced source of energy, this contributes to higher rural energy costs. In addition, more urban families use as a primary heating fuel natural gas, which is significantly cheaper than fuel oil or liquid petroleum gases. The Energy Department, however, predicts that differences in total expenditures for energy between urban and rural areas will be reduced over the next decade. In addition, the following preliminary conclusions have been supported by analysis:

- o Urban/rural differences are less significant than differences among states and regions.

- o With some exceptions, expanded domestic energy production resulting from higher energy prices is expected to continue favoring economic development in nonmetropolitan areas. Nuclear power plant construction tends to benefit suburban economies. The problems of boomtown economies are predicted for some metropolitan areas, such as Houston.

A number of experts have pointed out the need for better data at the state and local level. Industrial energy consumption and expenditure information is particularly important, because rising energy prices have the most complicated impact on industrial expansion and economic development. This is the one sector, however, that the Energy Information Administration has no authority to survey, so less is known about industrial energy use.

BACKGROUND

Before the oil embargo of 1973-74, energy prices were low and even declining in real terms (see Table 1). These low prices encouraged abundant use of energy resources.

National energy use relative to real gross national product (GNP) increased until 1920. From the early 1920s through the early 1960s the ratio of energy to GNP dropped by almost 40 percent. But as Dale Keyes points out: "Since energy is not a significant factor of production in many industries, this decline in energy intensity is probably coincidental. It likely reflects a shift in the products and services unrelated to energy costs."[1]

Until the mid-1930s, the United States supplied all of its own uses and was one of the major world exporters. In the 1940s, however, America's use of oil outstripped its rates of production.[2] It then began to import crude oil, natural gas (from Canada), and, later, refined products. Because large supplies of fossil fuels were easy to extract, prices remained low on the world market through the early 1970s, giving U.S. consumers no warning of subsequent price increases.

TABLE 1: Trends in Real Energy Prices to Individual Consumers (1967 = 100)

Year	Electricity	Gas	Fuel Oil	Gasoline
1925	262.1	NA	NA	NA
1930	248.8	NA	NA	NA
1940	227.9	168.8	96.4	114.5
1950	125.9	101.4	100.7	99.6
1955	118.7	101.0	107.2	104.2
1960	112.5	110.1	100.3	104.3
1965	104.9	105.4	99.9	100.4
1970	91.3	93.3	94.0	90.8
1971	80.2	95.8	95.7	87.6
1972	94.9	97.6	93.1	85.9
1973	93.8	96.1	101.1	88.7
1974	99.9	97.4	144.2	108.3
1975	103.6	108.7	143.1	106.0
1976	104.2	118.0	145.0	104.3
1977	104.3	131.8	154.4	103.7
1978	107.3	144.2	160.7	102.6
1979*	102.3	159.4	171.7	115.7

* Through October only.

SOURCE: Dale L. Keyes, Energy Economics and U.S. Energy Policy: Effects on Urban America (Washington, D.C.: Unpublished, June 1980). p. 2-2.

The "energy crisis" of the 1970s reflected the increased price of future energy supplies rather than real scarcity of energy sources.[3] Industrial nations have relied on easily extracted sources of fossil fuels. With world demand increasing and the availability of these resources being restricted--either through depletion or through policy decisions--the United States and other industrial nations have had to pay increased prices for energy. Recent studies have documented both the abundance of energy sources and the problems involved in switching to alternative sources. Questions remain about the environmental effects of expanded coal and nuclear use. Renewable energy resources are enormous, but require new technologies now in various stages of development. These three require substantial investment to be produced and consumed in greatly expanded quantities. Fortunately, for the near term, a fourth cost-effective alternative is available: energy efficiency.

Much of the nation's existing equipment and buildings was acquired during a period of low energy prices. Energy efficiency was not encouraged: there were even disincentives for conservation (such as declining rates for large users). As a result, the United States today is one of the most energy-inefficient nations in the industrialized world (see Table 2). This means the United States could decrease its consumption dramatically while increasing the gross national product.[4] If seriously pursued, such a course could also have a favorable impact on world oil prices and result in even greater savings to the U.S. economy.

Although hampered by a lack of readily available data at the state and regional level, economists have begun to reevaluate the impact of energy prices on the U.S. economy. Increasing attention is being paid to energy availability and prices and their impact on regional, state, and local economies. Although differences in energy prices between regions have been

TABLE 2: Energy/Output Relationships for Selected Countries, 1972

Country	Gross Domestic Product per capita (dollars)	Energy consumption per capita (tons oil equiv.)	Energy/GDP ratios (tons oil equiv. per $million)	(Indexes, U.S.=100)
United States	5,643	8.35	1,480	100
Canada	4,728	8.38	1,772	120
France	4,168	3.31	795	54
West Germany	3,991	4.12	1,031	70
Italy	2,612	2.39	915	62
Netherlands	3,678	4.68	1,272	86
United Kingdom	3,401	3.81	1,121	76
Sweden	5,000	5.31	1,062	72
Japan	3,423	2.90	849	57

SOURCE: Joel Darmstadter, Joy Dunkerley, and Jack Alterman, How Industrial Societies Use Energy: A Comparative Analysis (Washington, D.C.: Resources for the Future, Inc., October 1977), p. 5.

noted, it was assumed that they were such a small fraction of household and industrial production costs that, by themselves, they would not be a determining or even significant factor in location decisions. Recently, however, energy analysts have begun to conclude that a significant portion of regional household cost differences is energy-related. While evidence is less certain with respect to the effects of energy prices on industrial location, economists are putting more emphasis on energy as a factor in plant closings and location decisions.

Because higher energy prices are a relatively new phenomenon, research on the economic impact of rising prices is exploratory and preliminary. In part, this has been due to a lack of reliable data and in part because energy use affects every aspect of the U.S. economy. For example, the relationship of energy prices to other commodity price increases is not well understood, because energy use is so intertwined in the production and distribution of goods and services.

In addition, very little attention has been paid to the regional, state, and local dimensions of cartel-driven energy price increases and this failure is another barrier to achieving a complete understanding of the last decade's energy economics.

This paper summarizes what is known about the relationship between energy price increases and national economic performance in the 1970s. It also presents a variety of data concerning regional and urban/rural differences in price and economic performance.

I. ENERGY AND THE NATIONAL ECONOMY

The increase in size and percentage of national energy spending over the past decade -- the era of OPEC and decontrol of domestic oil price -- has been formidable. As a key part of this study, the Northeast-Midwest Institute has, for the first time, compiled data on national and state energy expenditures for different sectors of the economy. This analytic effort reveals that in 1970 (before OPEC had become a household word), the United States paid $83 billion for energy, but that by 1980, energy spending had reached $378 billion. Transportation consumed more energy dollars than any other sector, adding up to 45 percent of total energy expenditures in 1980. During that one year, it cost the United States almost twice as much for the energy needed to move people and things ($160 billion) as the total energy spending for industrial production ($93 billion). Spending for residential energy was $71 billion; for the commercial sector, $54 billion.

In 1970, the United States consumed 66.8 quads (quadrillion British thermal units, Btu) of energy. By 1980, the total had climbed to 76.2 quads, an increase of 14 percent. Consumption actually peaked in 1979 at 79.0 quads. Compared to the 14 percent increase in consumption, however, the price the United States paid for energy increased by 132 percent in real dollars, outstripping the decade's inflation rate of 94 percent and the small 37 percent increase in real personal income.[5]

The summary presented here of the impact on the national economy of rising energy prices from 1973 to 1980 draws in part on the Department of Energy's Interrelationship of Energy and the Economy: A Supplement to the National Energy Policy Plan (July 1981). DOE is required by Title VIII of the U.S. Department of Energy Organization Act (P.L. 95-91) to evaluate the "effect of current and projected energy trends on the economic health of the nation." The law specifies that "attention be given to the national goals of full employment, price stability, and economic growth as well as to particular regional needs and to the special energy requirements of people who live in rural areas." In order to assess the impact of price increases on energy use and cost in the economy, DOE used forecasting models of Data Resources, Inc. and Wharton Econometric Forecasting Associates, Inc. to simulate the growth of the U.S. economy if energy prices had not increased in real terms between 1973 and 1980.

The report concluded that the effects of higher energy prices were significant, cumulative, and long lasting. Energy price hikes continued to affect the economy for several years after the actual increase. The 1979-80 increase magnified the impact of the 1973-74 increase. Briefly summarized below are the effects of higher energy prices on overall prices, gross national product, consumption, investment, and productivity.

Overall Prices. The total direct and indirect effect of rising energy prices was to increase the Consumer Price Index from 1.9 percent to 2.5 percent annually.

Gross National Product. If the energy price increases of 1973-74 had not occurred, the recession of 1973-74 might have been moderated, but still would have happened. After 1975, under the lower price scenario, the gross national product would have risen above actual levels. The loss in growth rate in real GNP in 1980 might have been avoided altogether.

Consumption. Higher energy prices had three principal effects on personal consumption expenditures: 1) increases in energy prices produced a relative reduction in the real incomes and wealth of households; 2) inflation pushed incomes into higher marginal tax brackets, further reducing real disposable incomes of households; and 3) changes in the relative price of goods and services affected the mix of goods and services purchased by consumers. The report concluded that the major expenditure item most clearly affected by this loss of disposable income was auto sales.

"On average, yearly auto sales were between 1.3 million and 1.6 million units lower during the period as a result of high energy prices," according to the DOE report. Furthermore, with energy prices as they actually were, the import share of this smaller U.S. auto market increased from about 16 percent in 1973 to about 26 percent in 1980. If real energy prices had remained constant, the import share might have been lower (perhaps only about 20 percent in 1980). This implies that domestic automakers could have sold more than 2.5 million additional autos in that year than they actually sold -- a 40 percent increase over actual levels. Besides autos, other categories of durables (such as large appliances) were particularly affected."[6] If Detroit had been producing high gas mileage autos during this period, however, these effects probably would have been mitigated at the expense of foreign imports. The report concluded that service categories of consumption were least affected by the price increases. The results suggest that "high prices accelerated the trend in the U.S. economy toward a more service-oriented economy."[7] Table 3 summarizes the growth rate in these sectors under both actual and simulated conditions.

TABLE 3: Compound Growth Rate, 1973-1980

	Actual	Simulated	Difference
Durables	1.6	3.8 - 4.1	2.2 - 2.5
Nondurables	2.2	3.1	0.9
Services	3.8	4.1 - 4.5	0.3 - 0.7

SOURCE: Office of Policy, Planning, and Analysis, U.S. Department of Energy, Interrelationship of Energy and the Economy--A Supplement to the National Energy Policy Plan, July 1981, p. 22.

Investment. Higher energy prices reduced investment in both plants and equipment. Because real output did not grow as fast as it might have, capital formation was slow. Moreover, the existing stock of plant and equipment was not fully utilized as a result of higher energy prices. The DOE report concluded: "Overall, investment in fixed plant and equipment by 1980 was estimated to have fallen about 12 percent below where it would have been without the series of energy price boosts."[8]

Productivity and Employment. Higher energy prices appear to have resulted in slower growth in productivity. On average, it appears that labor productivity was reduced by roughly 0.4 percent because of higher energy costs. The employed labor force declined along with labor productivity. Employment losses were estimated from 900,000 to 2.1 million jobs over the 1973-1980 interval.

More recently, the Congressional Research Service in an analysis of the impact of a $5-a-barrel oil import fee, detailed the following effects of such a hypothetical price increase:

TABLE 4: Hypothetical Effect
Of A $5-A-Barrel Oil Import Fee

	1982	1983	1984
INFLATION (Recent Change in Consumer Price Index)	+0.7	+1.4	+1.5
IMPLICIT PRICE DEFLATOR Gasoline and Oil, percent change	+7.4	+10.5	+9.7
INDUSTRIAL PRODUCTION INDEX (percent change)	-0.7	-1.7	-2.2
REAL GROSS NATIONAL PRODUCT (percent change)	-0.4	-1.0	-1.4
TOTAL EMPLOYMENT (Nonagricultural, in 1,000s)	-20.0	-31.0	-96.0
UNEMPLOYMENT RATE (Percent change)	+0.1	+0.3	+0.5
INTEREST RATES (U.S. three month bills, percent change)	+0.1	+0.6	+1.1
HOUSING STARTS (1,000s of units)	-7.0	-54.0	-78.0

SOURCE: Bernard A. Gelb and Everson W. Hull, "Revenue and Macroeconomic Impacts of an Oil Import Tax: A Brief Review" (Washington, D.C.: Congressional Research Service, April 6, 1982), p. 9. (Simulated effects generated with the aid of the Data Resources, Inc. Econometric Model.)

According to Otto Eckstein, chairman of the board of Data Resources Inc., energy price increases affect the underlying inflation rate in this way: "While there are numerous short-lived inflationary elements in the economy, the underlying thrust comes from the gradual rise in the price of labor and capital, the core inflation rate. Labor costs are determined by the rate of wage increase adjusted for the productivity trend. Capital costs are set by interest rates, equity prices and the relative price of capital goods."[9] The temporary inflation forces are classified into two headings: "shock inflation," such as increases of oil and food prices, and demand inflation, the classic pull of tight labor and product markets on the price level. Total inflation is the sum of all three sources: core, shock and demand."[10] Eckstein concludes: "The energy revolution of 1973 was a principal cause of the worsening core inflation of the last decade. Oil prices may exercise a decisive influence on core inflation in the 1980s."[11] Higher energy prices were "largely responsible for the poor investment and productivity results of the years 1974 to 1980."[12] Although energy experts cannot predict with certainty future energy prices, there is general agreement they will continue to increase. Despite the 1982 downturn in prices, the dependence of industrial nations on OPEC oil, particularly once the recession ends, is likely to result in further price increases. At the very least, the United States is faced with the uncertainty and instability of world oil prices.

II. IMPACT OF RISING ENERGY PRICES ON REGIONAL ECONOMIES

The Energy Department has evaluated the impact of regional differences in household energy costs, but has not addressed the larger question of impact on regional economies.

Rising energy prices have varying effects on regional and state economies for a number of reasons:

- o The average price of available energy in a state varies enormously for some fuels (electricity) and less for others (distillate fuel).
- o The mix of fuels available to a state varies as well, affecting the average price of energy in a sector. Vermont, for example, relies almost exclusively on petroleum products and electricity for home energy use (they accounted for 97.4 percent of total residential energy consumption in 1979).[13]
- o State economies vary widely in employment base, degree of industrial development, and energy use.
- o Wide variation exists in relative production of energy resources, with most states energy consumers, and a few net energy producers.

Before analyzing the impact of rising energy prices on regional and state economies, it is important to establish a fundamental point. While it has been widely accepted that some variation in prices of fuels exists at the state level, it often has been assumed the variation is not great and that differences are becoming smaller over time. Table 5 and Table 6 compare prices for the highest and lowest priced energy for 1970 and 1978 in the continental United States and demonstrate that the conventional wisdom is incorrect.

As shown in Table 5, when the average price of energy used per sector and state is compared between 1970 and 1978, price differences decreased in the transportation and industrial sectors while widening in the residential and commercial sectors. Although industrial price differences decreased between 1970 and 1978, they still were very substantial (184 percent), a wider variation than in any other sector. Residential energy price differences were also significant (159 percent).

Table 6 shows price differences within the residential sector for individual fuels. The average price of oil and gas between the states decreased from 1970 to 1978, while differences in the price of electricity widened to 325 percent in 1978.

TABLE 5: Comparison of Average Price of Energy
(Most Expensive/Least Expensive States, 1970 and 1978)

Sector	State	Price/Billion Btu, 1970	Percent Difference	State	Price/Billion Btu, 1978	Percent Difference
Residential	New Jersey	$1,746		New Jersey	$4,191	
	Tennessee	958	82.3	Washington	1,617	159.2
Commercial	Connecticut	1,375		Delaware	3,688	
	Wyoming	821	67.5	Washington	1,701	116.8
Industrial	Massachusetts	1,192		New Hampshire	3,120	
	Louisiana	320	272.5	Washington	1,099	183.9
Transportation	Vermont	2,917		Connecticut	5,117	
	Louisiana	1,674	74.3	Louisiana	3,677	39.2

SOURCE: Diane DeVaul, National and State Energy Expenditures, 1970-1980 (Washington, D.C.: Northeast-Midwest Institute, July 1981).

TABLE 6: Comparison of Average Energy Price in Residential Sector
(Most Expensive/Least Expensive States, 1970, 1978, and 1980)

Fuel	State	Price/Million Btu, 1970	Percent Difference	State	Price/Million Btu, 1978	Percent Difference	State	Price/Million Btu, 1980	Percent Difference
Distillate	Colorado	$1.46		Rhode Island	$3.84		Connecticut	$7.74	12.0
	Georgia	1.21	21.0	Arizona	3.37	14.0	Montana	6.94	
Gas	Massachusetts	3.04		Connecticut	4.43		Connecticut	5.57	148.0
	Wyoming	0.66	360.6	Kansas	1.72	151.7	Kansas	2.29	
Electricity	New York	8.40		New York	17.19		New Jersey	22.98	345.0
	Washington	2.97	182.8	Washington	4.19	324.6	Washington	5.16	

SOURCE: Energy Information Administration, State Unit Price Database (Washington, D.C., February, 1981).

Residential Energy Prices

Any discussion of residential energy costs must focus primarily on the cost of home heating/cooling and electricity needs. Gasoline usage is covered more extensively in a separate discussion of the transportation sector. In 1970, the average Washington state household paid $242 for home energy needs, while Vermont's average bill was $430--or 78 percent higher. By 1980, New Hampshire's average bill of $1,450 was estimated to be 189 percent higher than the Washington State bill of $501.[14] Three factors account for the bulk of these cost differences:

- Climate. Average heating and cooling degree days vary widely across the United States. Northern tier states through the Central and Eastern parts of the nation generally have higher heating needs. The Pacific Division has the advantage of a more moderate climate. For example, the average household in New England heating with fuel oil consumed 961 gallons in 1980. In the Pacific Division, the average use was 497 gallons. As a result, the average New England household paid $1,076 for fuel oil alone in 1980 while a family in the Pacific Division paid $545, or about half as much (see Table 7).

- Characteristics of the Housing Stock. A number of characteristics of the housing stock also affect energy consumption. The age of the housing stock, for example, reflects differences in energy efficiency. In the Northeast, houses built before 1940 averaged 161 million Btu per household in 1979, compared to 66 million Btu for a house built between 1975 and 1979. In the South, houses built before 1940 consumed 105 million Btu on average; that figure dropped to 81 million Btu in the period 1975 to 1979. Moverover, the percentage of housing stock built before 1940 varies widely by region, from 47 percent in the Northeast and 35 percent in the Midwest to 17 percent in the South and West (see Table 8).

- Transportation Costs. Added transportation costs for fuels supplied to areas with no local supplies account for much of the price differences among states. As one report noted: "Fuel is rather expensive to transport, in terms of value relative to weight. Hence, fuel should have a considerably lower price near its point of origin, yielding an incentive for use as that point is approached."[15] As the price of fuel increases, however, transportation costs become a relatively smaller part of the total price. For this reason, price differentials appear to be decreasing.

TABLE 7: Households Heating with Fuel Oil (Distillate, Kerosene)

Census Division	April 1980-March 1981 Number of Households (in millions)	Average Amount Consumed (in gallons)	Average Expenditure (per household)	April 1981-March 1982 Average Expenditure (per household)
New England	2.7	961	$1,076	$1,192
100% Poverty	0.2	1,099	1,236	1,363
125% Poverty	0.3	920	1,004	1,141
Middle Atlantic	6.5	946	1,053	1,169
100% Poverty	0.7	976	1,079	1,206
125% Poverty	1.3	977	1,087	1,208
East North Central	1.5	673	744	785
100% Poverty	0.1	908	1,024	1,087
125% Poverty	0.2	827	915	973
West N. Central	0.5	668	714	785
100% Poverty	0.0	688	731	1,087
125% Poverty	0.0	586	624	973
South Atlantic	3.5	611	685	732
100% Poverty	0.8	587	651	693
125% Poverty	1.0	593	665	710
East South Central	0.1	494	546	588
100% Poverty	0.0	371	443	472
125% Poverty	0.0	371	443	472
West South Central	0.0	701	754	811
100% Poverty	0.0	701	754	811
125% Poverty	0.0	701	754	811
Mountain	0.1	560	590	652
100% Poverty	-	-	-	-
125% Poverty	0.0	821	858	956
Pacific	0.5	497	545	586
100% Poverty	0.0	298	305	330
100% Poverty	0.0	412	440	478

SOURCE: Northeast-Midwest Institute. Calculations based on preliminary data from the Department of Energy, Residential Energy Consumption Survey, April 1980-March 1981. Prices updated using Monthly Energy Review, March 1982.

TABLE 8: Age of Housing Stock by Region and Average Household Consumption, 1979

Year of Stock	Average Consumption per Household (in million Btu)	Number of Households (in millions)	Percent of Regional Consumption	Percent of National Consumption
NORTHEAST				
1939 or earlier	161	8.1	47.1	31.9
1940 - 1949	144	1.4	8.1	20.3
1950 - 1959	149	2.9	16.9	19.7
1960 - 1964	172	1.4	8.1	18.7
1965 - 1969	109	0.9	5.2	11.5
1970 - 1974	109	1.0	5.8	12.3
1975 - 1969	66	1.5	8.7	21.1
NORTH CENTRAL				
1939 or earlier	174	8.9	43.0	35.0
1940 - 1949	168	1.8	8.7	26.1
1950 - 1959	179	3.5	16.9	23.8
1960 - 1964	154	1.4	6.7	18.7
1965 - 1969	144	1.6	7.7	20.5
1970 - 1974	158	1.9	9.2	23.5
1975 - 1979	156	1.6	7.7	22.5
SOUTH				
1939 or earlier	105	4.2	16.9	16.5
1940 - 1949	95	2.6	10.5	37.7
1950 - 1959	97	5.2	21.0	35.4
1960 - 1964	94	3.0	12.1	40.0
1965 - 1969	83	3.7	14.9	47.4
1970 - 1974	86	3.4	13.7	42.0
1975 - 1979	81	2.7	10.9	38.0
WEST				
1939 or Earlier	107	4.2	28.4	16.5
1940 - 1949	86	1.1	7.4	15.9
1950 - 1959	100	3.1	20.9	21.1
1960 - 1964	104	1.7	11.5	22.7
1965 - 1969	94	1.6	10.8	20.5
1970 - 1974	96	1.8	12.2	22.2
1975 - 1979	99	1.3	8.8	18.3

SOURCE: Northeast-Midwest Institute. Calculations based on Energy Information Administration, Residential Energy Consumption Survey: 1979-1980 Consumption and Expenditures Part II: Regional Data (Washington, D.C., May 1981).

- o Availability of Fuel. Historic patterns of consumption as well as availability of alternatives affect the average price paid by consumers. As shown in Table 9, for example, the number of households heating with natural gas, oil, electricity and other fuels varies widely from state to state. In New England, the state with the highest percent of households using fuel oil was Maine, with 71 percent in 1980; the lowest was Massachusetts, with 54 percent. The range in Mid-Atlantic states was from 56 percent in Delaware to 34 percent in Pennsylvania, still well above the national average of 18 percent. The Midwest ranged from a high of 25 percent in Wisconsin to a low of 5 percent in Illinois. North Carolina was highest in the South, with 40 percent. (Four states had only 0.1 percent: Arkansas, Louisiana, Oklahoma, and Texas.) In the West, Alaska led with 39 percent; Arizona and California were lowest, with 0.2 percent.

The energy source that varies the most in price among the states is electricity. This is particularly significant because DOE projects a 5 percent increase in household electricity consumption by 1990, based on the expectation that the number of appliances will increase, as well as the use of heat pumps for heating/cooling in some regions. In Table 10, the five states with the highest electricity prices are compared to the states with the lowest electricity rates. In 1980, the highest state, New Jersey households paid 345 percent more for electricity than did those in the lowest state, Washington.

In addition to increased household use of electricity for appliances, electricity has become the leading heat source for new homes in 1980, accounting for 43 percent of new construction (compared to 13 percent for natural gas and only 6 percent for fuel oil). In contrast, gas is the leading fuel source for total existing housing stock, with 55 percent, compared to an average of 18 percent for electricity and oil. Wood is the primary source for only 3 percent.[16]

TABLE 9: Household Heating By Energy Source
(Percent of State Total), 1980

	Gas	Petroleum	Electric	Coal	Wood	Other or No Fuel Used
New England						
Connecticut	23.0	63.4	11.1	0.1	2.3	0.2
Maine	2.6	71.1	10.6	0.1	15.3	0.3
Massachusetts	33.5	53.8	10.3	0.2	2.1	0.1
New Hampshire	15.0	60.5	12.8	0.2	11.4	0.2
Rhode Island	33.5	57.9	6.3	0.2	1.9	0.2
Vermont	11.1	61.3	9.6	0.5	17.3	0.2
Mid-Atlantic						
Delaware	30.4	55.7	11.6	0.2	1.9	0.2
Maryland	48.1	35.8	13.5	0.6	1.8	0.3
New Jersey	45.4	46.0	7.5	0.2	0.6	0.5
New York	39.1	53.7	4.6	0.3	1.9	0.5
Pennsylvania	49.9	34.3	10.4	3.5	1.6	0.3
Midwest						
Illinois	87.1	4.7	7.1	0.4	0.6	0.3
Indiana	67.9	12.2	16.6	0.5	2.6	0.2
Iowa	79.5	10.3	8.6	0.2	1.3	0.2
Michigan	80.0	12.8	5.0	0.2	1.7	0.3
Minnesota	66.9	22.2	8.0	0.1	2.6	0.3
Ohio	73.9	9.6	13.8	0.9	1.5	0.3
Wisconsin	65.9	25.0	6.5	0.1	2.3	0.2
South						
Alabama	64.6	0.5	26.2	1.0	7.5	0.2
Arkansas	71.9	0.1	16.9	*	10.8	0.2
District of Columbia	61.2	29.1	9.0	0.2	*	0.4
Florida	22.5	10.9	61.5	*	1.4	3.7
Georgia	72.7	2.2	19.4	0.1	5.4	0.3
Kentucky	58.7	6.0	23.0	5.9	6.2	0.2
Louisiana	75.7	0.1	22.4	0.0	1.6	0.2
Mississippi	66.2	0.2	24.7	0.1	8.7	0.1
North Carolina	22.0	40.1	28.9	0.4	8.4	0.2
Oklahoma	80.0	0.1	15.4	*	4.4	0.1
South Carolina	38.6	23.4	31.0	0.3	6.6	0.2
Tennessee	33.3	3.8	48.9	2.6	11.3	0.1
Texas	72.8	0.1	25.3	*	1.3	0.5
Virginia	32.6	34.2	25.3	1.1	6.6	0.2
West Virginia	61.1	10.5	18.7	5.1	4.5	0.2
West						
Alaska	36.4	38.7	14.8	2.1	7.3	0.8
Arizona	60.7	0.2	35.0	*	3.4	0.7
California	81.2	0.5	15.7	*	1.9	0.9
Colorado	87.1	0.5	9.6	0.7	1.7	0.3
Hawaii	5.8	0.3	4.5	*	1.0	88.4
Idaho	30.9	16.8	38.6	2.7	10.4	0.6
Kansas	89.0	0.4	7.8	*	2.6	0.1
Missouri	79.4	3.3	12.0	0.1	4.9	0.2
Montana	68.1	5.9	15.8	1.1	8.9	0.2
Nebraska	84.3	4.7	9.3	*	1.4	0.4
Nevada	53.1	7.1	36.7	0.1	2.7	0.2
New Mexico	86.1	0.4	7.0	0.2	5.9	0.4
North Dakota	52.0	27.8	17.2	2.0	0.6	0.4
Oregon	25.4	19.2	42.0	0.1	12.7	0.5
South Dakota	58.5	22.8	15.4	0.2	2.9	0.2
Utah	82.5	2.9	10.2	2.6	1.6	0.1
Washington	24.0	18.4	52.5	0.2	4.6	0.3
Wyoming	83.6	1.1	10.9	1.7	2.7	0.1
U.S. Average	58.8	18.1	18.4	0.6	3.2	0.8

*less than 0.1 percent

SOURCE: Northeast-Midwest Institute. Calculations based on U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population and Housing, Provisional Estimates of Social, Economic, and Housing Characteristics (Washington, D.C., March 1982), pp. 90-94.

TABLE 10: Electricity Prices by State, 1980
(in dollars per million Btu)

U.S. Average $14.37

HIGHEST		LOWEST	
New Jersey	$22.98	Wyoming	$8.64
Hawaii	22.61	Oregon	8.60
New York	22.23	Idaho	8.03
Rhode Island	21.61	Montana	7.91
Massachusetts	20.33	Washington	5.16

SOURCE: Energy Information Administration, unpublished data, State Btu Unit Price Database, (Washington, D.C., February 14, 1982).

Economic Implications. Although the effects of rising household energy prices and state and regional variations on local economies are still being evaluated, the following preliminary conclusions may be drawn.

- Rising energy prices have had a significant impact on household disposable income, and the impact varies widely among regions.[17]
- Differences in regional home energy costs are expected to increase with higher real energy prices and with natural gas deregulation. Only minor shifts will take place in the relative positions of the regions.[18]

Because the demand for consumer goods and services accounts for much of the U.S. gross national product (in 1978 it represented 64 percent of the total), consumer spending patterns have a significant impact on the national economy.[19]

When the employment effect of spending $1 million on consumer purchases is compared with the effect of spending a million dollars on oil, electricity, or natural gas consumption, significant differences emerge:

- average consumer spending of $1 million on goods and services results in 50.3 labor years of employment;
- expenditures on oil consumption result in 16.1 labor years of employment;
- electricity expenditures produce 24.0 labor years; and
- natural gas expenditures result in 15.5 labor years.[20]

However, $1 million invested in conservation and solar measures would create 48.8 labor years in the national economy -- less than consumer spending for goods and services, but significantly more than for oil, natural gas, and electricity. In addition, the local employment impact is substantially different. A detailed employment impact study for Nassau and Suffolk Counties on Eastern Long Island was recently completed. This area was chosen because of the detailed information available on housing stock, energy consumption, and employment characteristics. In this energy-consuming area, expenditures on conservation and solar energy would result in 2.8 times as much local employment (48.8 labor years compared to 17.7 labor years).[22]

The major reason for these different employment effects is that the oil, gas, and electricity production industries are capital intensive, as Table 11 demonstrates.

TABLE 11: Capital Investment Per Employee
(1976 dollars)

Industry	Investment
Petroleum	108,000
Public Utilities	105,500
Chemicals	41,000
Primary Metals	31,000
Stone, Clay, Glass	24,000
All Manufacturing (Average)	19,500
Food and Kindred Products	18,000
Textile Mill Production	11,000
Wholesale and Retail Trade	11,000
Services	9,500
Apparel and Other Fabricated Textiles	5,000

SOURCE: Steven Buchsbaum and James W. Benson, Jobs and Energy (New York: Council on Economic Priorities, 1979), p. 63.

Industries that supply plant and equipment for the energy industry are relatively capital intensive as well, resulting in low employment gains from additional energy production. Manufacturing employment would actually increase by 15.6 man years if $1 million were invested in conservation and solar energy rather than consumption, as a result of equipment and materials needed under the conservation/solar option. [22]

Commercial Energy Prices

The commercial sector as defined by the Energy Information Administration includes institutional buildings, hospitals, schools, and federal, state, and local government buildings. In 1970, the commercial sector of the U.S. economy paid $11.7 billion for energy use; by 1980, the bill was an estimated $54 billion. Average commercial energy prices showed similar differences to those in the residential sector, but did not vary as much. They varied by 67 percent in 1970, with Connecticut high at $1,375 per billion Btu compared to $821 in Wyoming. By 1980, differences in average commercial energy prices had widened to an estimated 120 percent, with New Hampshire high at $6,127 per billion Btu and Washington State low at $2,786.[23]

In addition to fuel availability, factors such as a relatively high rate of growth in this sector, climatic variations, age of building stock, and efficiency investments affect total commercial energy usage. A recent survey on energy consumption in nonresidential buildings found that age of nonresidential building stock varies widely by region, as shown in Table 12. In the Northeast, 74 percent of the buildings were constructed in 1960 or before. Sixty-six percent of Midwestern buildings were built in the same period, compared to 55 percent in the South and 60 percent in the West. Buildings constructed after 1970 also varied widely: 9 percent in the Northeast, 18 percent in the Midwest, 22 percent in the South and 23 percent in the West.

TABLE 12: Percent of Total Square Footage in Nonresidential Buildings by Region and By Year Constructed

	1900 or Before	1901-1920	1921-1945	1946-1960	1961-1970	1971-1973	1974-Present
Northeast	16	15	23	20	17	3	6
North Central	10	13	20	23	16	5	13
South	3	6	17	29	22	6	16
West	4	8	21	27	18	7	16

SOURCE: Energy Information Administration, Nonresidential Buildings Energy Consumption Survey: Building Characteristics (Washington, D.C., March 1981), pp. 58-61.

Fuel dependence varies considerably among the regions. The Northeast relies primarily on natural gas (46 percent) and fuel oil (42 percent). Natural gas accounts for 68 percent of heating needs of nonresidential buildings in the North Central region, while the South depends on electricity (37 percent) and natural gas (33 percent). The West is primarily dependent

on natural gas (49 percent) and electricity (33 percent). In addition, both the South and West have higher percentages of buildings without heat sources than the Northeast and North Central regions. Air conditioning use is lowest in the West, with 44 percent, and highest in the South, with 72 percent (see Table 13).

TABLE 13: Percent Use of Fuel in Nonresidential Buildings by Region, 1979

Heating Fuel Type	U.S. Average	Northeast	North Central	South	West
Heating Fuel Used	89	94	93	85	86
No Heating Fuel Used	11	6	7	15	14
Natural Gas	49	46	68	33	49
Electricity	24	13	12	37	33
Fuel Oil	19	42	14	16	11
Liquid Petrol Gas	5	2	6	7	4
Wood	2	1	2	3	5
Coal	1	-	1	1	1
Steam	1	2	1	1	1
Air Conditioning Used	64	63	64	72	44

SOURCE: Energy Information Administration, Nonresidential Buildings Energy Consumption Survey: Fuel Characteristics and Conservation Practices (Washington, D.C., March 1981), p. 23.

Very little empirical research is available on the effect of energy price increases on the commercial sector. A straightforward analysis suggests that energy costs represent a larger share of operating costs, and presumably would either lead to higher prices for commodities or services--if the added expense is passed on to the consumer--or would result in lower profits.

Energy costs appear to be growing items on state and local budgets. Both climatic differences and energy price differences among the states affect the cost of providing state and local services. The International City Management Association, for example, surveyed 1,479 local governments (cities and counties) on energy management activities in 1980. Of those covered by the survey, 59 percent of the cities and 43 percent of the counties reported "that energy expenditures constituted the second largest item in their operating costs, following only personnel."[24]

Economic Implications. Average commercial prices vary in the same general pattern as residential energy prices. In areas with high prices and relatively severe climates, consumers will be faced with higher prices for goods and services as well as higher household energy costs. Further research needs to be done in this area, however, before any definitive conclusions can be drawn.

Industrial Energy Prices

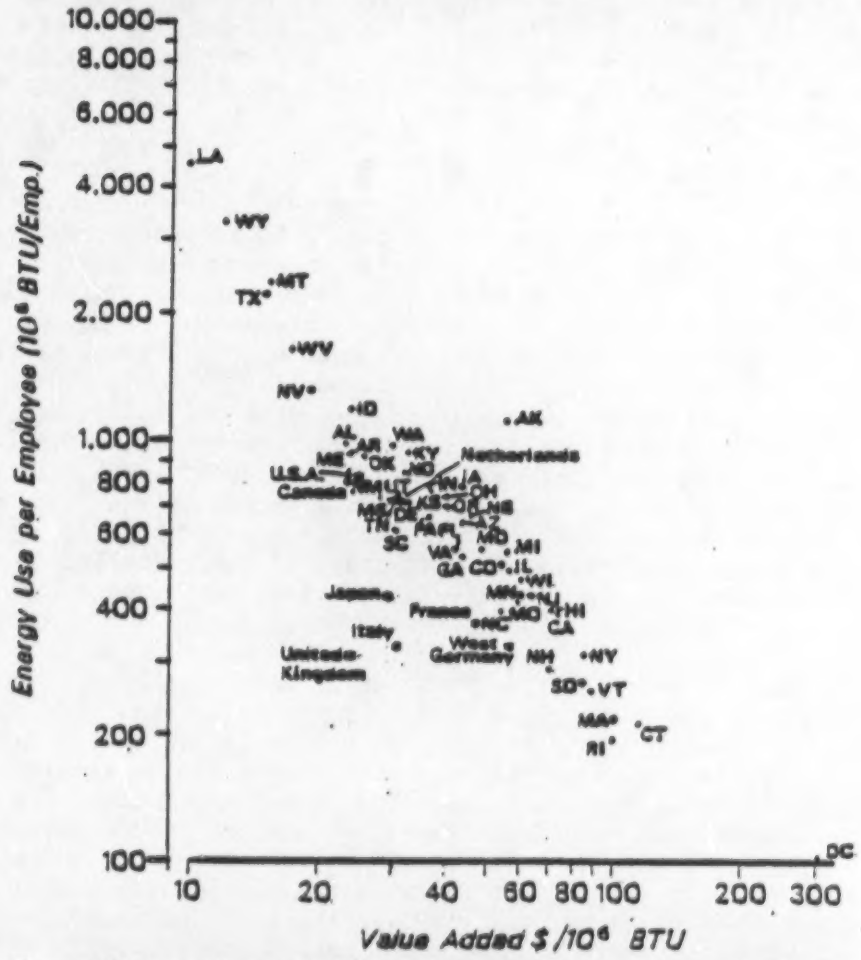
In 1970, the industrial sector used $15.3 billion worth of energy. By 1980, industrial energy cost $93 billion.[25] The industrial sector, as defined by the Energy Information Administration, includes manufacturing, mining, agriculture, and heavy construction. This section will focus on the use of energy in the manufacturing sector. Although industrial energy prices reflect regional and state variations similar to those of the residential and commercial sectors, the use of energy in the industrial sector differs markedly from residential and commercial energy consumption. Climatic differences account for only a small portion of industrial energy use. Most energy consumed in the manufacturing sector is used to fire boilers and to run machines and tools. Both the type of manufacturing and its particular product mix (some products are more energy-intensive than others to manufacture), as well as the labor/energy ratio, make industrial energy consumption trends more difficult to determine.

The location of energy-intensive industry historically has reflected the availability of energy supplies. As illustrated in Figure 1, more energy-intensive industries are located close to supplies of oil, natural gas, and coal. The most energy-intensive industries are located in Louisiana, Wyoming, Montana, and Texas. The least energy-intensive are in Rhode Island, Connecticut, and Massachusetts. For most other industries, however, readily accessible supplies of a wide variety of raw materials, water, skilled labor forces, and potential markets also have played important roles in determining industrial locations. Apart from very energy-intensive industry (the petrochemical and plastics industry, for example), manufacturing location decisions apparently have been based in the past on considerations other than relative energy prices.

Economic Implications. The South and West have increased their use of industrial energy since 1960, when these regions consumed 37 percent and 16 percent, respectively, compared to 21 percent in the Northeast and 26 percent in the Midwest. By 1980, the South consumed 44 percent of the national total, the West accounted for 19 percent and the Northeast and Midwest used 15 percent and 23 percent, repectively.[26]

There has been intense debate over the last few years on whether higher energy prices affect plant locations. A review of the literature suggests there is little conclusive evidence that energy costs are a direct factor in the location of most manufacturing activity. There are several reasons for this:

Figure 1: Energy Intensity in Manufacturing



Source: U.S. Annual Survey of Manufactures (1976); United Nations, *National Accounts Statistics* (1978); World Bank, *World Development Indicators* (1979); OECD, *Energy Balance of OECD Countries* (IEA 1979).

Figure 3. Energy intensity in manufacturing in United States and selected industrial countries, 1976.

SOURCE: T. R. Lakshmanan, "Regional Growth and Energy Determinants: Implications for the Future," The Energy Journal, Volume 2, Number 2, 1981.

- Energy costs are a relatively low percentage of total costs in most manufacturing plants. Even in energy-intensive industries, direct energy costs account for less than 8 percent of the total value of shipments; the average energy costs for most energy-intensive industries is closer to 3 percent.[27]

- Average transportation energy costs remain substantially higher than average industrial energy costs. In 1980, for example, 1 billion Btu of energy used in the transportation sector cost $8,622, compared to $3,166 in the industrial sector.[28] As a result, higher energy prices have the effect of making the transportation of raw materials and finished products a more important cost consideration than the cost of industrial energy. This varies significantly depending on the product, however.

The interrelationship of energy costs, wage differentials and transportation expenses varies among products, and a detailed analysis is required to determine the relative impact of these factors on new location decisions. Increasing energy costs appear to have had an impact in some industries. For example, a recent study concluded that for three specific industries (plastics products, electronic components, and electronic transmitting equipment) energy costs did have an impact on new birth activity for two: the plastics and electronic components industries. These industries have roughly the same ratio of energy expenditures to value added as the average of all U.S. manufacturing. At the same time, transportation costs are not a major factor.

The study concluded that although wage differentials were still the most important factor considered in location decisions, "for these two industries, the effect of energy costs on new birth activity is larger than one would expect on the basis of aggregate data on industrial energy expenditures."[29] The results indicate that a 1 percent change in energy prices would cause slightly less than a 1 percent change in the number of new births for the plastics and electronic components industries.[30] "On the other hand, energy prices have very little effect on births of single-establishment firms in the low energy-intensive industries such as electronic transmitting equipment."[31] Energy prices, though, did seem to have a substantial effect on the birth of new branch plants in the industry. The study suggests that for those industries where transportation costs are not a significant factor, industrial energy prices are becoming an important factor affecting new plant and branch plant location decisions.

The age of buildings and equipment and their resulting efficiency probably are more important considerations in plant closings or reduced production than direct energy costs. Because many of these older plants are in the Northeast and Midwest, this may account in part for the resulting drop in those regions' percentage of industrial energy consumption. As the U.S. industrial base lags behind the efficiency of other nations, higher costs would seem to become a more serious handicap in the international market. The steel industry, for example, which accounts for more than 70 percent of energy consumption in the primary metals industry, uses 15 to 30 percent more energy per ton of output than its foreign competitors.[32]

This contributes to the competitiveness of imported steel in the U.S. market. Moreover, the poor financial performance of the domestic steel industry has reduced the availability of capital needed to replace inefficient production equipment. As a result, the primary metals industry has reported the lowest gains in energy efficiency of the ten most energy-intensive industries (7.8 percent). Bituminous coal, used in steel making, has declined significantly, accounting for 6 percent of the decline in the absolute amount of energy consumed in the industry, yet this reduction probably is a result of the 9 percent decline in output since 1972.[33] Because the steel industry's production costs remain noncompetitive in the world market, and its ability to improve productivity and efficiency are limited by a lack of capital for modernization, most of the industry's conservation efforts have been limited to low- or moderate-cost improvements.

In contrast, the aluminum industry, which accounts for 20 percent of energy use in the primary metals industry, is one of the few industries in which conservation is a major component of research and development spending. It also is located in the Northwest, which has the lowest industrial electricity rates in the country.

William H. Miernyk has pointed out that employment trends since 1970 have supported the hypothesis that rising energy prices have had an influence on the selective growth and decline of economic activity. Employment growth in energy-intensive manufacturing has shifted from energy-poor to energy-rich regions. Between 1970 and 1977, for example, the regions that show a net loss of jobs in energy-intensive industry are the Northeast and Midwest, while the South and West gained employment in these industries. Employment in indirectly vulnerable industries also decreased in the Northeast and increased only slightly in the Midwest (see Table 14).

Similarly, Irving Hoch concluded that manufacturing employment growth was highest in the West South Central and Rock Mountain regions between 1972 and 1977. He also noted that energy production industries showed strong gains in employment, wage rates, and earnings relative to all other industry during this period (see Table 15).

Hoch concluded that "expansion in fuel extraction sectors has had considerable multiplier effects. In the period 1972 to 1977, per capita incomes grew 4 percent more in fuel-producing states than in the rest of the country, and more than half that gain appeared to involve the indirect impacts of multiplier effects."[34] Coal extraction employment tripled in Montana and Wyoming since 1972, compared to a 20 percent to 40 percent increase in West Virginia, Kentucky, and Pennsylvania. Conventional oil and gas reserves are estimated to be located primarily in Alaska, offshore, and continental U.S. fields--many of which are located in the Rocky Mountain area. Some expansion could occur in Texas and Louisiana with the elimination of price controls; and there is potential for offshore production on the East Coast.

TABLE 14: Percent Change in Employment, By Energy Price Responsiveness Category,* 1970-1977

Region	Directly Vulnerable	Indirectly Vulnerable	Sheltered	Employment
New England	-9.37	-2.90	8.32	4.04
New York/New Jersey	-20.25	-22.48	-1.56	-5.97
Mid-Atlantic	-9.98	-1.32	13.33	7.46
South Atlantic	8.70	12.19	27.48	22.41
Midwest	-5.36	1.25	14.90	9.01
Southwest	26.84	19.44	34.01	32.03
Central	10.75	8.11	17.25	15.69
North Central	24.95	24.51	45.21	41.74
West	10.09	11.91	26.73	23.47
Northwest	16.27	15.81	34.49	30.06
United States	-0.90	2.16	18.18	13.46

* Responsiveness Categories:

Directly vulnerable activities are energy intensive. Their products or services are sold in national, or broad regional, competitive markets (not necessarily price competitive). They are not bound to present locations by resource or transportation considerations. They are not major suppliers of goods or services to other directly vulnerable activities.

Indirectly vulnerable activities are major suppliers of one or more directly vulnerable activites. They are not bound to their present locations by resource or transportation considerations, nor by agglomeration economies. The markets served by these activities are relatively competitive.

Sheltered activities are resource- or transport-oriented, or they provide goods or services for local rather than broad regional or national consumption. The markets served by these activities may be locally competitive, but they are not competitive in national or regional markets. Finally, sheltered activities provide goods or services that local consumers are not readily willing to give up, or for which there are no close substitutes.

SOURCE: William H. Miernyk, The Differential Effects of Rising Energy Prices on Regional Income and Employment (Washington, D.C.: Resources for the Future, 1980), p. 22.

TABLE 15: Production Impacts on Employment Growth

	1972	1977	Percent Change, 1971-1977
U.S. Employment (in thousands)			
Coal	159	240	1.51
Oil and Gas	258	365	1.41
All other industry	71,931	78,903	1.10
Wage Rates			
U.S. Average	100	100	
Coal	128	146	1.14
Oil and Gas	125	144	1.15
Earnings (billions of dollars)			
Coal	2.1	4.9	2.36
Oil and Gas	3.0	9.5	3.21
All other industry	759.4	1,148.8	1.51

SOURCE: Irving Hoch, "Energy and Location," in Nonmetropolitan America in Transition (University of North Carolina Press, Chapel Hill, North Carolina, 1981), p. 8.

According to T. R. Lakshmanan, "Manufacturing activity is the most sensitive to higher energy prices. The Midwest region, containing the industrial states of Ohio, Michigan, Indiana, and Illinois, therefore demonstrates the greatest sensitivity to different energy price levels."[35] Similarly, the Midwest Governor's Report found

> The impact of rising energy prices, both directly and indirectly (effects of consumers having less disposable income with which to purchase goods and services) has had the most severe effect on the Midwest economy. The employment base in the Midwest is more dependent on industry than other regions. About 25 percent of workers are employed in the Midwest industrial sector, compared to the U.S. average of 21 percent. Since a large amount of secondary service employment is also dependent on industry in the Midwest, the region is thus sensitive to any changes in industrial employment.[36]

The most dramatic impact of rising energy costs on state economies, however, is their effect on the "balance of trade" between energy-producing and energy-consuming states. In 1970, for example, 4.9 million cubic feet of Texas natural gas cost the equivalent of 1,000 pounds of New York State butter. In 1979, less than one-fourth as much Texas gas (1.1 million cubic feet) equaled the cost of 1,000 pounds of New York butter. Similarly, in 1970, 9.5 million cubic feet of Texas natural gas equaled the price of 1,000

bushels of Illinois corn. By 1978, the same amount of corn equaled the cost of only 2.2 million cubic feet of Texas gas (see Table 16).

The indirect effects of rising energy prices also have been substantial. As households spend a greater percentage of disposable income on energy--and, as a consequence, less on other goods and services--the employment impact of their spending is cut in half or more. In addition, manufacturing employment also is adversely affected, because manufacturing of energy production equipment is less labor-intensive as well.

Transportation Energy Prices

The United States pays the most for energy used in transportation. In 1970, it cost Americans $35 billion to move people and things; by 1980, the cost was $165 billion. In 1980, the average price of energy was the highest in the transportation sector ($8,600 per billion Btu), as compared to $3,170 in the industrial sector, $4,400 in the commercial sector, and $4,400 in the residential sector.[37]

In 1970, the Northeast-Midwest region consumed 40.7 percent of the total transportation energy, while paying 43.9 percent of the cost. The South and West consumed 59.3 percent of the total, while paying 56.1 percent of the cost.[38] By 1978, the Northeast-Midwest region had dropped to 39.3 percent of use, paying 39.3 percent of the cost. The South and West consumed and paid 60.7 percent. Transportation energy costs are especially important to the South and West, with their greater land area, less concentrated population, and heavy reliance on the private transportation.

According to the Department of Energy, however, the average household expenditure for gasoline varied by only 14 percent among the DOE regions, from a low of $1,046 per family in New England and the Mid-Atlantic region to a high of $1,193 in the Midwest. By comparison, DOE estimated an 83 percent difference in home energy costs among regions in 1980.[39] It is not clear why states in the South and West account for a significantly higher percentage of transportation energy use; further research is needed in this area.

The opportunity for increased efficiency also is greatest in the transportation sector because the stock of vehicles is replaced more quickly than the stock of residential and commercial buildings.

Economic Implications. Because petroleum products make up 97 percent of total energy used in the transportation sector, average energy prices are substantially higher than in other sectors. As a result, transportation costs for families from 1979 to 1980 rose more than any other item except taxes.[40] Transportation also is the area where the opportunity for increased efficiency is the greatest, because new fuel-efficient vehicles are available and the stock of vehicles turns over more quickly than building stock. The higher fuel efficiency of imported cars, however, contributed to dramatic increases in the percentage share of U.S. sales by imports during the 1970s, further hurting the domestic auto industry.

TABLE 16.

EXCHANGE RATIOS BETWEEN SELECTED COMMODITIES AND FOSSIL FUELS, 1970 AND 1978

ocation of Producer	Commodity & Quantity		Percent of U.S. Production		Value($s)		Exchange Ratios: Texas Natural Gas (10^6 cu. ft.)			Exchange Ratios: Oklahoma Crude Oil (barrels)			Exchange Ratios: West Virginia Coal (tons)		
			1970	1978	1970	1978	1970	1978	%Δ	1970	1978	%Δ	1970	1978	%Δ
NY	Butter	1000 lbs.	4.6	3.5	704	1,141	4.9	1.1	-78	220.7	104.7	-53	88.8	33.6	-62
NY	Milk	5 tons	9.2	8.7	599	1,050	4.2	1.1	-74	187.8	96.3	-49	75.5	30.9	-59
NY	Eggs	1000 doz.	3.3	2.7	393	465	2.7	0.6	-81	123.2	42.7	-65	49.6	13.7	-72
NJ	Processed Tomatoes	10 tons	5.6	1.5	416	650	2.9	0.7	-76	130.4	59.6	-54	52.5	19.1	-64
MA	Cranberries	1000 lbs.	46.9	48.0	128	216	0.9	0.2	-78	40.1	19.8	-51	16.1	6.4	-60
DE	Broilers	1000 lbs.	4.8	4.8	148	260	1.0	0.3	-70	46.4	23.9	-48	18.7	7.6	-59
IL	Corn	1000 bu.	22.3	19.3	1,370	2,150	9.5	2.2	-77	429.5	197.2	-54	172.8	63.2	-63
IL	Hogs	10 head	12.3	11.3	235	845	1.6	0.8	-50	73.7	77.5	+5	29.6	24.8	-16
IL	Soybeans	1000 bu.	18.7	16.5	2,900	6,680	20.1	6.7	-67	909.1	612.8	-33	365.7	196.5	-46
IL	Sulfuric Acid	10 tons	5.9	4.6	195	349	1.4	0.4	-71	61.1	32.0	-48	24.7	10.3	-58
MN	Flaxseed	1000 bu.	14.9	20.4	2,450	5,750	17.0	5.8	-66	768.0	527.5	-31	309.0	169.1	-45
MN	Rye	1000 bu.	7.4	10.1	1,150	2,640	8.0	2.7	-66	360.5	242.2	-33	145.0	77.6	-46
MN	Barley	1000 bu.	5.9	13.4	1,140	2,300	7.9	2.3	-71	357.4	211.0	-41	143.8	67.6	-53
GA	Broilers	100 lbs.	9.1	14.2	258	260	5.5	0.3	-95	100.4	23.9	-76	49.3	7.6	-85
VA	Sulfuric Acid	10 tons	3.4	2.1	203	401	1.4	0.4	-72	63.6	36.8	-42	25.6	11.8	-54

SOURCE: William H. Miernyck, The Differential Effects of Rising Energy Prices on Regional Income and Employment, (to be published by Resources for the Future, Washington, D.C.), 1981.

Higher transportation costs relative to industrial energy costs are expected to exert pressure toward decentralized industrial location by reducing the costs of transporting goods to markets. For industries serving national markets for which decentralized production is not feasible, higher transportation costs will continue to contribute to higher prices for products.

III. URBAN/RURAL DIFFERENCES IN ENERGY EXPENDITURES

It is difficult to evaluate the effects of higher energy prices on local economies and to compare urban and rural areas because of the lack of reliable data at this level. The federal government provides information on state energy use and prices, but with the exception of household energy expenditures, it does not provide comprehensive data on rural and urban energy usage.

The Energy Department evaluated differences in energy expenditures between rural and urban areas in 1980 and estimated the differences for 1990. Rural areas were defined as those lying outside standard metropolitan statistical areas or, if within an SMSA, classified by the Census Bureau as rural. Therefore, many suburban areas are included within the definition of urban areas.

In 1980, DOE found that rural households, on average, spent more money on energy than urban households. In 1980, the average fuel bill for a rural family was $2,276 (including gasoline); the average for its urban counterpart was $2,006. By 1990, the rural family's bill was estimated to increase by 4 percent in real terms to $2,369. Urban household bills were projected to grow by 8 percent to $2,175, narrowing the difference between them. Most of the difference in total expenditures is attributed to home residential energy costs, not gasoline usage patterns or prices (see Table 17). Total costs of gasoline are projected to drop for both, primarily reflecting the use of more fuel-efficient cars.

Home energy costs for the average rural family were estimated to be $1,156, while the urban family spent $971. By 1990, the rural family was expected to spend $1,372 and the urban family $1,293. This narrowing difference in total costs is attributed primarily to electricity expenditures. Rural families paid $625 for electricity in 1980 and are projected to pay $796 in 1990; in contrast, urban families paid $487 in 1980 and are estimated to spend $599 in 1990. "Rural households consume about 40 percent more electricity in both years; and the considerably higher cost of electricity per Btu accounts for the higher total for home fuel expenditures,"[41] the DOE study said. It also pointed out that fewer rural households have access to gas and home heating oil.

The published research and analysis of urban/rural differences is not extensive, but the Institute's review of available literature suggests that:

- Differences in rural/urban energy expenditures exist but are less extensive than regional and state variations.
- Estimates of the impact of future energy price increases suggest that, unlike regional and state variations, urban/rural differences will narrow.

TABLE 17: Energy Expenditures by Urban and Rural Households, 1980-1990
(1981 Dollars)

	ALL FUELS	TOTAL HOME FUELS	INDIVIDUAL HOME FUELS			
			ELECTRICITY	HEATING OIL	NATURAL GAS	GASOLINE
Median Expenditures						
1980						
Urban	2,006	971	487	702	345	1,110
Rural	2,276	1,156	625	590*	353*	1,125
Difference	270 (13%)	185 (19%)	138 (28%)	-112 (-16%)*	8 (2%)*	15 (1%)
1990						
Urban	2,175	1,293	599	771	606	998
Rural	2,369	1,372	796	702*	656*	1,025
Difference	194 (9%)	79 (6%)	197 (33%)	-69 (-9%)*	50 (8%)*	27 (3%)
Difference: 1980-90						
Urban	169 (8%)	322 (33%)	112 (23%)	69 (10%)	261 (76%)	-112 (-10%)
Rural	93 (4%)	216 (19%)	171 (27%)	112 (19%)*	303 (86%)*	-100 (-9%)
Percent of Income						
1980						
Urban	10.6	5.1	2.5	3.4	1.7	5.5
Rural	14.7	7.4	4.0	3.5*	2.2	7.0
Difference	4.1 (39%)	2.3 (45%)	1.5 (60%)	0.1 (3%)*	0.5 (29%)*	1.5(27%)
1990						
Urban	13.3	7.7	3.5	4.5	3.4	5.4
Rural	18.0	10.2	5.9	4.6*	4.7*	7.1
Difference	4.7 (35%)	2.5 (32%)	2.4 (69%)	0.1 (2%)*	1.3 (38%)*	1.7(31%)
Difference: 1980-90						
Urban	2.7 (25%)	2.6 (51%)	1.0 (40%)	1.1 (32%)	1.7 (100%)	011(-2%)
Rural	3.3 (22%)	2.8 (38%)	1.9 (48%)	1.1 (31%)*	2.5 (114%)*	011(1%)

* Figures are not reliable on account of the small number of households in rural areas using heating oil and natural gas.

SOURCE: U.S. Department of Energy, Interrelationship of Energy and the Economy -- A Supplement to the National Energy Policy Plan, July 1981, p. 57.

- While electricity usage is the major factor in home energy cost differences (with rural households continuing to consume roughly 40 percent more than urban households), rural electricity prices generally are lower than urban prices.

- Energy costs as a percentage of disposable income are higher in rural areas because of a somewhat lower average disposable income. The difference was expected to decrease somewhat in the future. DOE found that the average rural family spent 14.7 percent of its disposable income on energy in 1980, which contrasts sharply with the 10.6 percent paid by the average urban family. By 1990, these figures were expected to be 18.0 percent for rural families, contrasted with 13.3 percent projected for urban families.

- Natural gas is the cheapest fuel in all areas, and its share of total fuel use is much higher in urban than rural areas. Rural areas use more liquid petroleum gas, which is more expensive than piped natural gas. Residents of small cities apparently are well supplied with natural gas, however.[42]

Hoch cautioned that data used to compare energy costs often omit such "indirect items as spending on public transportation; taxis; rental cars; rail and air fares; they also tend to exclude heating and utility costs paid for by landlords rather than by tenants."[43] Because these expenditure items are greater in urban areas, the data reported may underestimate urban energy costs.

There are also important differences in urban and rural gasoline consumption patterns:

- Automobile travel by rural households is about 40 percent higher than urban households. However, because mass transit and taxi trips are excluded from the data, metropolitan energy use tends to be understated. Trips to work account for roughly 40 percent of both urban and rural transportation costs.[44]

- Commuters living outside urban areas who drive to work have the sharpest increase in transportation costs. Because highway travel is more fuel efficient than city driving, however, the differences are less than that expected when comparing only miles traveled.

Hoch reported that gasoline price increases will tend to affect SMSA rural residents the most, followed by SMSA suburban residents, SMSA central city residents, and non-SMSA rural residents. Those affected the least will be non-SMSA small city residents.

Urban and rural energy expenditures, however, vary substantially by region. As shown in Table 18, regional differences in energy expenditures are far more important than intraregional differences. In the Northeast, households in SMSAs had higher energy bills than rural households, and paid

substantially more than rural households outside of SMSAs. Rural households both within and outside SMSAs paid more in the North Central region than elsewhere. Differences were generally less in the South and West between urban, rural, SMSA, and non-SMSA.

TABLE 18: Comparison of Urban and Rural Household Energy Consumption by Region, 1978 (in million Btu)

Location	Northeast		North Central		South		West	
	Amount Consumed	Cost	Amount Consumed	Cost	Amount Consumed	Cost	Amount Consumed	Cost
Urban*	147	$1,032	176	$876	93	$719	101	$517
Rural*	132	1,038	146	1,047	92	785	95	568
SMSA	154	1,085	177	919	88	744	102	512
non-SMSA	110	832	149	933	99	743	94	587

*Urban includes housing in places of 2,500 inhabitants of more as defined in the 1970 census. Rural refers to nonurban areas.

SOURCE: Energy Information Administration, Residential Energy Consumption Survey: 1978-1979 Consumption and Expenditures -- Part II, Regional Data (Washington, D.C., May 1981.)

As discussed earlier, the age of housing stock affects the efficiency of energy use in the residential sector. Table 19 shows the age of housing stock as a percent of total by rural and urban area in each of the four regions. The percent of housing stock built since 1970 was higher in the rural areas of all regions:

	Urban	Rural
Northeast	11.7 percent	17.3 percent
North Central	11.8 percent	25.4 percent
South	19.8 percent	31.4 percent
West	15.9 percent	36.9 percent

TABLE 19: Age of Housing, Stock, Rural/Urban in 1978
(in percent)

	Northeast		North Central		South		West	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Pre-1939	49.5	33.6	41.0	45.0	18.3	18.0	27.1	30.4
1940-49	10.2	13.1	9.0	6.3	10.5	11.3	10.0	7.1
1950-59	16.9	12.1	20.1	11.9	22.4	16.0	17.7	11.4
1960-64	5.8	10.1	8.6	4.8	14.2	12.7	14.9	5.7
1965-69	5.4	11.0	6.2	17.9	14.4	18.9	11.7	18.2
1970-74	5.4	11.0	6.2	17.9	14.4	18.9	11.7	18.2
1975-	6.3	6.3	5.6	7.5	5.4	12.5	4.2	18.7
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

SOURCE: Calculations based on Energy Information Administration, Residential Energy Consumption Survey: Characteristics of the Housing Stock and Households, 1978 (Washington, D.C., February 1980), pp. 10-11.

Energy costs vary between rural and urban areas as a function of both usage and price. On average, rural households consume less energy than urban areas but pay more for it. Higher natural gas use for home heating in urban areas accounts for lower energy prices because natural gas is priced lower than bottled gas, propane, and kerosene, which are used more extensively in rural areas. In addition, rural households consume 40 percent more electricity than urban households. Electricity prices are higher than those of other energy sources, contributing to higher energy costs in rural areas, but are lower in rural areas than in urban areas. There also is a higher percentage of new housing stock in rural areas, which over time will contribute to lower average energy consumption, unless active weatherization efforts are undertaken in the older urban building stock.

IV. IMPACT OF RISING ENERGY PRICES ON LOW-INCOME POPULATION

This chapter discusses energy expenditures for households at 125 percent of the lower living standard as defined by the Bureau of Labor Statistics and at "poverty level," which in this case refers to the lower living standard. (This analysis includes 125 percent of the lower living standard because federal low-income energy assistance uses this benchmark to establish eligibility.)

The DOE report estimated that poverty-level households spent $1,220 on all household fuels (including gasoline) in 1980, compared to $2,139 for non-poverty households. By 1990, poverty-level households are projected to pay $1,311, compared to $2,347 for non-poverty-level households (see Table 20).

Home heating fuels are not the most significant cause of the difference between poverty and non-poverty families. Electricity expenditures account for the largest differences in home energy usage, $346 for a family in poverty and $529 for a non-poverty family. Expenditures for gasoline account for most of the remaining difference. Poverty-level families spent $637 in 1980 and are estimated to spend $607 in 1990 for gasoline, compared to $1,137 and $1,032 for non-poverty families.

These figures are based on the assumption that gasoline consumption is expected to decline for all groups at the same rate. Although poorer families tend to drive older and less fuel-efficient cars, the average mileage increase should be roughly similar when comparing cars of comparable age in both 1980 and 1990. "These estimates tend to understate the difference between gasoline use by the two groups in total, because a smaller percentage of poverty-level households drive personal autos," the DOE report said.[45] In 1980, 68 percent of the poverty-level households used gasoline, compared with 90 percent of other households; for 1990, the comparable projected figures are 52 percent and 87 percent."

When gasoline usage is excluded, there is less variation in home fuel costs between low-income and average households. The difference between electricity outlays by nonpoverty and poverty families increases from 53 percent in 1980 to 57 percent in 1990, whereas the gap in natural gas and heating oil cost is reduced somewhat. Heating oil cost differences, for example, drop from 27 percent to 15 percent and natural gas cost differences from 28 percent to 22 percent. The gap also narrows for home heating, the DOE report found: "the poor are less likely to reduce their consumption of heating fuels, because a larger portion of them live in older houses without insulation. By 1980, they may already have made the maximum reductions in use possible without substantial capital investment. Electricity and gasoline expenditures, on the other hand, tend to be more discretionary in nature. Additional appliances and air conditioning use are less likely among poor households."[46]

TABLE 20: Energy Expenditures in Relation to Poverty Status, 1980 and 1990*
(per household, 1981 dollars)

	ALL FUELS	HOME FUELS	ELECTRICITY	HEATING OIL	NATURAL GAS	GASOLINE
Expenditures						
1980						
poverty	1,220	732	346	541	276	637
125% of poverty	1,207	747	350	547	285	622
nonpoverty	2,139	1,033	529	687	352	1,137
Difference*	919 (75%)	301 (41%)	183 (53%)	146 (27%)	76 (28%)	500 (78%)
1990						
poverty	1,311	993	423	675	514	607
125% of poverty	1,349	1,023	426	690	527	594
nonpoverty	2,347	1,357	664	773	626	1,032
Difference*	1,036 (79%)	364 (37%)	241 (57%)	98 (15%)	112 (22%)	425 (70%)
Difference: 1980-90						
poverty	91 (7%)	261 (36%)	77 (22%)	134 (25%)	238 (86%)	-30 (-5%)
nonpoverty	208 (10%)	324 (31%)	135 (26%)	86 (13%)	274 (78%)	-105 (-9%)
Percent of Income						
1980						
poverty	32.4	18.9	8.7	15.3	7.0	19.2
125% of poverty	24.9	15.1	7.0	11.8	5.7	13.8
nonpoverty	10.8	5.2	2.6	3.3	1.7	5.5
Difference*	-21.6 (-67%)	-13.7 (-72%)	-6.1 (-70%)	-12.0 (-78%)	-5.3 (-76%)	-13.7 (-71%)
1990						
poverty	37.3	27.8	11.8	19.9	14.1	18.4
125% of poverty	31.5	23.5	9.8	15.9	11.9	14.3
nonpoverty	12.9	7.3	3.5	4.1	3.1	5.3
Difference*	-24.4 (-65%)	-20.5 (-74%)	-8.3 (-70%)	-15.8 (-79%)	-11.0 (-78%)	-13.1 (-71%)
Difference: 1980-90						
poverty	4.9 (15%)	8.9 (47%)	3.1 (36%)	4.6 (30%)	7.1 (101%)	-0.8 (-4%)
nonpoverty	2.1 (19%)	2.1 (40%)	0.9 (35%)	0.8 (24%)	1.4 (82%)	-0.2 (-4%)

* Nonpoverty versus poverty. Percent change in parenthesis.

SOURCE: U.S. Department of Energy, Interrelationship of Energy and the Economy -- A Supplement to the National Energy Policy Plan (Washington, D.C., July 1981), p. 60.

According to the Energy Department, the average expenditure by a family in poverty in 1980 to heat a home with fuel oil was $541. But more recent data suggest that this is a significant understatement of actual costs. The average family with income of less than $5,000 heating with fuel oil in 1980 paid roughly $811 (see Table 21). Similarly, a family with an income less than $5,000 paid an average of $404 in 1980 not $276 for natural gas.

TABLE 21: Estimated Expenditures for Household Energy, 1980

	Heating Oil		Natural Gas		Electricity*	
	Millions of Households	Dollars	Millions of Households	Dollars	Millions of Households	Dollars
Northeast						
Less than $5,000	1.0	1,026	0.9	542	1.6	267
$5,000-9,999	1.1	1,113	1.2	530	1.6	275
North Central						
Less than $5,000	0.1	783	2.2	515	1.6	264
$5,000-9,999	0.4	991	2.4	537	1.5	301
South						
Less than $5,000	0.5	441	2.1	296	2.3	301
$5,000-9,999	0.8	564	2.3	333	1.9	324
West						
Less than $5,000	0.2	675	.9	247	0.9	197
$5,000-9,999	0.2	788	2.1	249	1.9	208

*Does not include home heating or air-conditioning costs.

SOURCE: Northeast-Midwest Institute. Calculations based on Energy Information Administration, Residential Energy Consumption Survey: 1979-1980 Consumption and Expenditures -- Part II: Regional Data, May 1981, p. 24, 29, 34, 39, 84, 89, 94, 99, 104, 109, 114, 119. Updated by national average increase in prices in State Price Database, February 1982.

Energy Costs as a Percent of Disposable Income

Families at the poverty level spent 32.4 percent of their disposable income on energy in 1980. Families at 125 percent of that poverty level spent 24.9 percent, compared to an average of 10.8 percent for non-poverty households. Because most energy costs occur over a six month period or less, the impact on low- and fixed-income households can be overwhelming. Moreover, the percent of disposable income families in poverty spend on energy varies dramatically, depending on where they live and the type of fuel used to heat their homes.

DOE's analysis projects that home energy expenditures will consume 37.3 percent of a poverty household's disposable income by 1990. At 125 percent of poverty, the increase results in 31.5 percent of disposable income, as compared to 12.9 percent for a nonpoverty family. The most significant increases are for home fuels, while some decrease in gasoline expenditures is noted.

Although the Administration has correctly concluded that decontrol of energy prices will foster conservation investments, it is not clear whether low-income families can afford to invest in conservation and efficiency measures. Data from the 1979-80 Residential Survey conducted by the EIA documents the problem. In 1979, the lower living standard was $12,585. Data are available on investments of households with incomes of $14,999 or below, which is used to approximate those families eligible for low-income energy assistance. As shown in Table 22, the total portion of households represented in the survey with incomes of $14,999 or less was 48.2 percent, yet they accounted for only 30.7 percent of conservation investments. Households with less than $5,000 made only 4 percent of the total conservation investment, although they represented 13.3 percent of all households.

As shown in Table 23, there are significant regional differences in the percent of low-income families compared to the percent of total energy expenditures. In the Northeast, families with incomes of less than $15,000 represented 21 percent of the total number of families but accounted for 28 percent of total home energy expenditures. In the Midwest, these families represented 24 percent of all households but paid 27 percent of total home energy costs. The reverse was true in the South and West: 37 percent of all families in the South and 19 percent of all families in the West had incomes of less than $15,000, but these accounted for only 33 percent and 11 percent of energy expenditures in their regions.

Another problem is that landlords have invested little for conservation in rental housing units. Table 24 shows, for example, that conservation investments in rental units amounted to only 7.1 percent of all conservation investments in 1979. Yet rental housing units made up approximately one-third of the nation's households. There are limitations to the data presented here. The types of investments surveyed are more likely to apply to single-family structures than rental units, for example, and the survey did not cover buildings with more than five rental units. But, it is still a startling statistic. Table 25 shows the distribution by region of rented

TABLE 22: Conservation Investments by Household Income, 1979
(in millions of dollars)

Household Income	Share of all Households (percent)	Attic Insulation	Storm Door Storm Window	Wall Insulation	Total Investment	Share of Total Investments (Percent)
Less than $5,000	13.3	$ 51.6	$109.6	$ 11.2	$172.6	4.0
$5,000 to $9,999	17.4	310.0	96.8	171.8	578.6	13.5
$10,000 to $14,999	17.5	212.8	176.4	173.1	562.3	13.2
Subtotal: Less than $14,999	48.2	574.4	383.0	356.1	1,313.5	30.7
$15,000 to 19,999	12.9	105.0	162.4	234.9	502.3	11.8
$20,000 to 24,999	12.9	169.8	265.3	421.8	856.9	20.1
$25,000 to 34,999	15.1	296.4	395.2	354.0	1,045.6	24.5
$35,000 or more	10.9	164.0	242.5	147.8	554.3	13.0
Subtotal: More than $14,999	51.8	735.2	1,065.4	1,158.5	2,959.1	69.3

SOURCE: Northeast-Midwest Institute. Calculations from Energy Information Administration, Residential Energy Consumption Survey: 1979-1980 Consumption and Expenditures Part 1: National Data (Washington, D.C., April 1981), p. 57-69.

TABLE 23: Expenditures for Residential Energy by Low-Income Households and Regions, 1979

Region	Households		Total Residential Expenditures	
	Millions	Percent	Billions of dollars	Percent
Northeast				
Less than $5,000	2.1	5.4	1.8	6.9
$5,000 to $9,999	2.7	7.0	2.3	8.9
$10,000 to 14,999	3.3	8.5	3.2	12.2
Total	8.1	21.0	7.3	27.9
North Central				
Less than $5,000	2.6	6.7	1.8	6.9
$5,000 to $9,999	3.1	8.0	2.4	9.2
$10,000 to 14,999	3.4	8.8	2.8	10.7
Total	9.1	23.6	7.0	26.7
South				
Less than $5,000	4.3	11.1	2.3	8.8
$5,000 to $9,999	5.6	14.5	3.4	13.0
$10,000 to 14,999	4.2	10.9	3.1	11.8
Total	14.1	36.5	8.8	33.6
West				
Less than $5,000	1.6	4.1	0.6	2.3
$5,000 to $9,999	3.0	7.8	1.3	5.0
$10,000 to 14,999	2.7	7.0	1.2	4.6
Total	7.3	18.9	3.1	11.8

SOURCE: Northeast-Midwest Institute. Calculations from Energy Information Administration, Residential Energy Consumption Survey: 1979-1980 Consumption and Expenditures Part 2: Regional Data (Washington, D.C., May 1981), pp. 4, 9, 14, 19.

TABLE 24: Conservation Investments by Type and Ownership Rental, 1979*

	Households (millions)	Average Cost (dollars)	Total Cost (millions of dollars)	Investment (percent)
Attic Insulation				
Own	3.1	406	1,258.6	93.3
Rent	.3	302	90.6	6.7
Rent Free	0.0			
Total	3.4	—	1,349.2	100.0
Storm Door/Windows				
Own	3.3	408	1,346.4	90.5
Rent	0.5	224	112.0	7.5
Rent Free	0.1	295	29.5	2.0
Total	3.9		1,487.9	100.0
Wall Insulation				
Own	1.5	976	1,464.0	93.0
Rent	0.3	365	109.5	7.0
Rent Free	0.0			
Total	1.8	—	1,573.5	100.0
Total Conservation				
Own	6.4		4,069.0	92.3
Rent	0.8		312.1	7.1
Rent Free	0.1		29.5	.7
Total	7.3		4,410.6	100.0

* The conservation survey did not include buildings with five or more units.

SOURCE: Northeast-Midwest Institute. Calculations from Energy Information Administration, Residential Energy Consumption Survey: 1979-80 Consumption and Expenditures/Part 1: National Data (Washington, D.C., April 1981), pp. 57, 62, 67, 72.

TABLE 25: Ownership/Rental Distribution by Region, 1979

Region	Households (millions)	Regional Distribution (percent)	U.S. Total (percent)
NORTHEAST			
Own	10.0	58.1	19.2
Rent	7.2	41.9	29.6
Rent Free	0.0	0.0	0.0
Total	17.2	100.0	22.2
NORTH CENTRAL			
Own	15.5	74.5	29.8
Rent	5.0	24.0	20.6
Rent Free	.3	1.4	23.1
Total	20.8	100.0	26.8
SOUTH			
Own	17.4	69.9	33.5
Rent	6.8	27.3	28.0
Rent Free	.7	2.8	53.8
Total	24.9	100.0	32.1
WEST			
Own	9.1	61.9	17.5
Rent	5.3	36.1	21.8
Rent Free	.3	2.0	23.1
Total	14.7	100.0	18.9

SOURCE: Northeast-Midwest Institute. Calculations from Energy Information Administration, Residential Energy Consumption Survey: 1979-80 Consumption and Expenditures/Part II: Regional Data (Washington, D.C., May 1981), pp. 4, 9, 14, 19.

and owned housing units covered by the survey. The region with the greatest concentration of rental units clearly is the Northeast, where 42 percent of households lived in rental housing. The West had 36 percent, the South 27 percent, and the North Central region only 24 percent.

Rising energy prices have had a particularly harsh impact on low-income families. The Energy Department concluded in 1980 that energy costs for a family in poverty represented almost one-third of income (32.4 percent). For families at 125 percent of poverty, energy costs represented one-quarter of total family income. Moreover, the Energy Department projected that by 1990, energy costs for a poverty household will represent 37 percent of total family income (and 32 percent for families at 125 percent of poverty-level income). This is a staggering burden for families in poverty. The federal poverty line is established on the basis of the average cost of a minimum diet that represents one-third of total income. Thus, in 1980, energy costs and food costs represented two-thirds of the budget for a family in poverty. Shocking as these figures are, energy costs for families in poverty in the Northern tier states actually were much higher. The average energy bill for a household in 1980 (excluding gasoline), varied by 189 percent between New Hampshire and Washington State.

Federal programs designed to alleviate the impact of rising energy costs on the nation's low-income population fail to address the long-term implications of these trends. Although the low-income energy assistance program attempts to compensate for rising energy costs, relatively little funding is provided for low-income weatherization. The fiscal 1983 budget level now being considered for low-income energy assistance is $1.9 billion and $143 million for weatherization. Until this basic imbalance is resolved, the federal government will continue to face rising energy assistance needs while neglecting an opportunity to cut costs both to the federal government and to low-income families through weatherization investment. In addition, federal investment in weatherization for low-income housing would provide employment opportunities for relatively low-skilled workers in depressed areas while helping to reduce federal deficits in future years.

NOTES

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